

What is claimed is:

1. A clamping device for fixing a clamping object to a base by releasably engaging with an inner wall of a hole or side wall formed in the clamping object, wherein the clamping device is characterized by comprising:
 - 5 a clamping main body fixed to the base and is communicatively formed with a rod insertion hole and a piston receiving cavity,
 - a clamping rod which is inserted through the rod insertion hole of the clamping main body and protruding its top-end portion from the clamping main body, the top-end portion being provided with an engagement portion capable of
 - 10 engaging with the inner wall or side wall of the hole,
 - a piston member movably mounted in the piston receiving cavity of the clamping main body,
 - a rod support mechanism which moves the engagement portion of the clamping main body in a direction roughly rectangular to the longitudinal direction of the clamping rod and switchably supports the clamping rod in the clamping main body or the piston member across a clamping position and a clamp release position,
 - a piston driving means for driving the piston member across the clamping position and the clamp release position, and
- 20 a cam mechanism for driving the engagement portion of the clamping rod in a clamping direction roughly rectangular to the longitudinal direction of the clamping rod by a driving force of the piston driving means for driving the piston member to the clamping position.
2. The clamping device according to claim 1, further comprising a rod return mechanism for returning the clamping rod to the clamp release position when the

piston member is moved to the clamp release position.

3. The clamping device according to claim 2, wherein the rod support mechanism is constituted so as to rotatably support a longitudinal midway portion of the clamping rod on the clamping main body.

5 4. The clamping device according to claim 3, wherein the cam mechanism is provided with a sphere or a roller rotatably mounted on a base end portion of the clamping rod and an inclined portion formed in the piston member so that the sphere or roller makes contact therewith.

10 5. The clamping device according to claim 3 or 4, wherein the rod return mechanism is provided with a guided portion provided in the clamping rod and a guide provided in the piston member, which guides the guided portion and switches the clamping rod to the clamp release position.

15 6. The clamping device according to claim 2, wherein the rod support mechanism is constituted so as to slidably support the base end portion of the clamping rod on the piston member in a direction rectangular to the longitudinal direction of the clamping rod.

20 7. The clamping device according to claim 6, wherein the cam mechanism is provided with a sphere or a roller rotatably mounted on the inner wall of the rod insertion hole of the clamping main body and an inclined portion formed in the clamping rod so that the sphere or roller makes contact therewith.

8. The clamping device according to claim 6 or 7, wherein the rod return mechanism is provided with a guided portion provided in the clamping rod and a guide provided in the clamping main body, which guides the guided portion and switches the clamping rod to the clamp release position.

25 9. The clamping device according to any of claim 1 ~ 4, wherein the piston

driving means is provided with a spring for elastically energizing the piston member to the clamping position.

10. The clamping device according to any of claim 1 ~ 4, wherein the piston driving means is provided with an oil hydraulic operating chamber for driving the piston member to the clamp release position.

11. The clamping device according to any of claim 1 ~ 4, wherein the engagement portion of the clamping rod is provided with plural annular edges.

12. The clamping device according to any of claim 1 ~ 4, wherein an annular sealing member for sealing a space between the clamping main body and the clamping rod is fitted in the top-end portion of the rod insertion hole in the clamping main body.

13. The clamping device according to any of claim 1 ~ 4, wherein an air blowing means is provided for jetting air to a top end side of the rod insertion hole through an air passage between the clamping main body and the clamping rod.

15 14. The clamping device for fixing a clamping object in a state of loading the clamping object on a base, wherein the clamping device is characterized by comprising:

a clamping rod provided vertically in a base or a clamping main body connected to the base;

20 a clamping rod driving means for moving the clamping rod to the base and for holding the clamping rod in a position after movement; and

a means for bringing at least a part of the clamping rod into contact with an inner wall or outside wall of an open space formed in the clamping object.

15. The clamping device according to claim 14, further comprising a rod support mechanism which switchably supports the clamping rod in the base or

clamping main body across a clamping position where the clamping rod contacts with the inner wall or outside wall and a clamp release position where the clamping rod is separated from the inner wall or outside wall.

16. The clamping device according to claim 14 or 15, wherein the clamping rod driving means is provided with an actuator which enables moving the clamping rod to the clamp release position or the clamping position and an energizing means for energizing the clamping rod to the clamping position or the clamp release position.

17. The clamping device according to claim 16, characterized by providing a boosting mechanism which boosts an energization force due to the energizing means to generate a clamping force for clamping the clamping object by the clamping rod in the base or the clamping main body.

18. A clamping method for fixing a clamping object to a base, by means of utilizing plural holes provided in the clamping object, one or more guide rods movably provided in a base corresponding to one or more holes among the plural holes, and plural clamp rods provided movably; wherein

the guide rods are inserted into the holes of the clamping object and the clamping rods are inserted into other holes of the clamping object, and then

20 the clamping rods are driven by an actuator in a direction roughly rectangular to its longitudinal direction, each of the top-end portions of clamping rods is engaged with an inner wall of the hole, and the clamping object is aligned with the guide rods and fixed to the base.